


Hexavalent Chrome

5206, 1532.2, 8359, 5155

Why a Vertical Standard Now for Chrome 6?

- ◆ A culmination of evidence since the 1930's
 - ◆ 1974 ACGIH confirmed some forms carcinogenic
 - ◆ 1976 NIOSH confirmed some forms carcinogenic
 - ◆ 1980 NTP listing of certain forms as being carcinogenic
 - ◆ 1988 NIOSH all forms carcinogenic
 - ◆ 1993 OSHA petitioned for a standard
- 
- A stylized, dark teal mountain range graphic is located in the bottom right corner of the slide, partially overlapping the text of the last bullet point.

Health Effects

- ◆ Lung cancer
 - Risk of 10-45 per 1000 at PEL of 5 $\mu\text{g}/\text{m}^3$
- ◆ Nose, throat and lung irritation; nasal ulceration
- ◆ Asthma
- ◆ Skin irritation and ulceration
 - Allergic sensitization
 - Skin absorption



Scope

- ◆ All forms of Chrome 6
- ◆ Excluded:
 - Elemental and other valence states (-2, +3)
 - Pesticide applications – i.e. CCA, ACC treated wood
 - ◆ Use of CCA/ACC not excluded
 - Portland Cement (all sectors)
 - 5155 applies regardless
 - Objective data demonstrates <0.5 $\mu\text{g}/\text{m}^3$

Cancer Mechanism

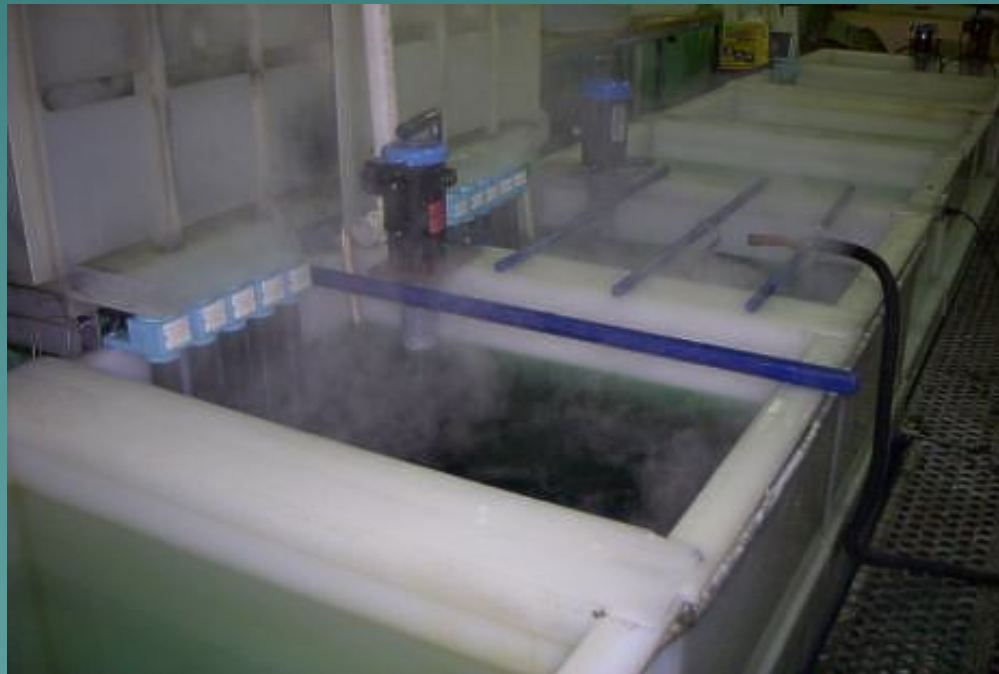
- ◆ Bronchogenic cancer latency 27-36 years
- ◆ Hexavalent Chromium is actively transported across cell membranes; Cr(III) absorbed only passively and much slower
- ◆ Inside the cell, Cr(VI) is reduced to trivalent, forming unstable intermediates
- ◆ Trivalent chromium and the intermediates, damage the DNA

Some Exposure Sources

- ◆ Electroplating

- hard vs. bright (decorative)

- ◆ Hard = >current + >temperature = >exposure



Some Exposure Sources

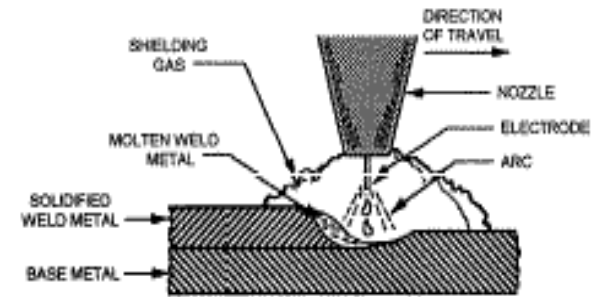
◆ Welding

- FCAW, SMAW, GMAW more than TIG
- Mild Steel ranges .2 to 3% chrome so a confined space concern

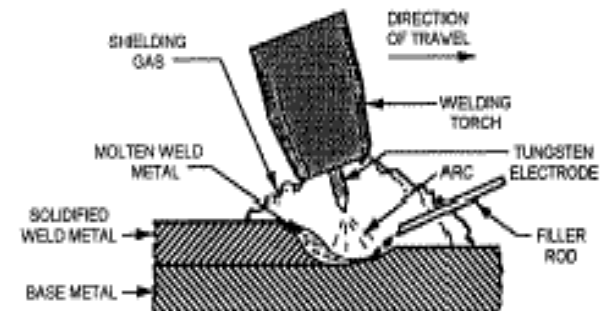
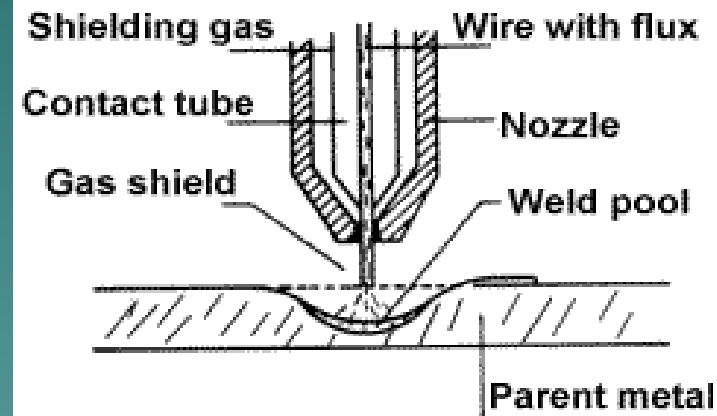
Courtesy: M. Horowitz

- ## ◆ High temperatures oxidize to 6+ form
- Regardless of “shielding”

Don't forget Manganese!



Gas metal arc welding (GMAW).



Gas tungsten arc welding (GTAW).

Some Exposure Sources

- ◆ Pigments – paints, inks, plastics
 - lead/zinc/barium/calcium/sodium chromate
 - potassium dichromate
- ◆ Textile dyes
 - ammonium/potassium dichromate,
 - sodium/potassium chromate
- ◆ Leather tanning
 - ammonium dichromate
- ◆ Wood preservatives
 - chromium trioxide

Some Exposure Sources

- ◆ Glass products: colored glass and clear glass due to contamination from refractory bricks; continuous fiberglass filaments
- ◆ Producers of refractory bricks
- ◆ Solid waste incineration
- ◆ Silk screen ink producers and users

Courtesy: M. Horowitz

A stylized, dark teal silhouette of a mountain range is positioned in the bottom right corner of the slide, extending from the right edge towards the center.

Some Exposure Sources

- ◆ Auto refinishing (paints, primers, anti-corrosion undercoats): sanding, grinding
- ◆ Construction: road striping and curb painting; paint removal; recycling refractory bricks; portland cement finishing
- ◆ Ferrochromium producers: heat resistant steels, welding rods, stainless, superalloys
- ◆ Nonferrous super alloy producers

Chrome 6 Standard Elements

◆ PEL

- 2.5 ug/m³ AL and 5 ug/m³ PEL
- 5155: 5 ug/m³ for most forms as Cr, regardless of solubility
 - ◆ Lead chromate – 5 ug/m as Cr; 20 ug/m as Pb
 - ◆ Strontium chromate – 0.5 ug/m
 - ◆ Still 100 ug/m Ceiling
- Still 500 ug/m for Cr metal, Cr(-2), Cr(+3)
- 558,000 exposed EEs; 352,000 >0.25 ug/m; 68,000 >PEL

Standard Elements

- ◆ Exposure determination
 - Scheduled monitoring
 - ◆ Initial representative
 - ◆ $>AI < PEL$: every 6 months
 - ◆ $> PEL$: Quarterly
 - ◆ Air monitoring data – at least 1 full shift/shift
 - ◆ Historical data
 - ◆ Objective data
- ◆ Employee notification ($> PEL$, regardless)
 - 15 days; 5 days for construction
 - Written control plan when $> PEL$

Objective Data

"...information other than employee monitoring that demonstrates the expected employee exposure to chromium (VI) associated with a particular product or material or a specific process, operation, or activity. Types of information that may serve as objective data include, but are not limited to, air monitoring data from industry-wide surveys; data collected by a trade association from its members; or calculations based on the composition or chemical and physical properties of a material. "

Exposure Determination

- ◆ Sample methodology
 - OSHA 8215.
 - Key issues:
 - ◆ Plating and other acidic environments requires field desorption and stabilization
 - ◆ PVC vs Quartz filter (quartz only good for 28 days) – no MCE!
 - ◆ Paints – clearly identify for lab!
 - ◆ Process samples within 8 days!

Typical Historical Exposure Levels

◆ Production (rolling mills)	3-22 ug/m ³
◆ Chrome plating	6-28
◆ Chromate pigment	2-8
◆ Textile dying	1-4
◆ Stainless welding	128-256

Courtesy: S. Davis

A stylized silhouette of a mountain range in a darker shade of teal, located in the bottom right corner of the slide.

Standard Elements

- ◆ Regulated area (construction and maritime excluded)
 - >PEL (or can be reasonably expected)
 - Demarcation
 - Limited access
- ◆ Carcinogen reporting (T85203+LC9030)
 - Language being developed that will specifically include construction

Standard Elements

Methods of Compliance:

- ◆ Engineering and work practice
 - To $< \text{PEL}$ where feasible
 - To $< 25 \mu\text{g/m}^3$ aircraft painting where feasible
 - Where > 30 days per 12 consecutive months
- ◆ Rotation prohibited

Standard Elements

Respiratory Protection:

- ◆ >PEL
 - Controls not feasible
 - <30 days per 12 consecutive months
- ◆ Emergencies
- ◆ Meets 5144 requirements

Standard Elements

Protective Clothing and Equipment:

- ◆ Potential for eye/skin contact hazard
- ◆ Removal and storage
 - End of shift or task
 - Not removed from workplace by EE
 - Proper storage and labeling
 - for laundry or disposal
- ◆ Cleaning/replacement as needed

Standard Elements

Protective Clothing and Equipment:

- ◆ Prohibit removal by agitation
- ◆ Inform laundry service
 - Potential health effects
 - Process with minimal EE contact
 - Minimize airborne generation

Standard Elements

Hygiene Areas and Practices:

- ◆ Where protective clothing and PPE required
 - Change rooms that conform with 3367
 - Separate storage

Standard Elements

Hygiene Areas and Practices:

- ◆ Where (hazardous) skin contact occurs
 - Wash facilities that conform with 3366
 - Ensure EE wash hands and face at end of shift and prior to eating, drinking, etc, or use the toilet
- ◆ Eating and drinking areas (3368)
 - Free as practicable of Cr6
 - No PPE, unless “cleaned”

Standard Elements

Hygiene Areas and Practices:

- ◆ Prohibited activities - No consumption, carrying or storing of food, etc.
 - in regulated areas
 - areas where contact occurs

Standard Elements

Housekeeping:

- ◆ Maintain surfaces free as possible of contamination
- ◆ Immediate spill clean-up
- ◆ Cleaning methods:
 - HEPA vacuum or equivalent
 - ◆ Dry shoveling, sweeping only if vacuum not feasible
 - No compressed air
 - ◆ Unless coupled with LEV or only option
- ◆ Waste/contaminated materials labeled per 5194 in sealed containers

Standard Elements

- ◆ Medical Surveillance
 - >AL, 30 or more days per year
 - Experience adverse symptoms
 - Exposed in an emergency
- ◆ Frequency
 - Within 30 days of assignment
 - Annually
 - Within 30 days of a PLHCP recommendation
 - EE symptoms
 - Within 30 days of emergency exposure
 - Termination of employment

Standard Elements

Hazard Communication:

- ◆ In addition to 5194 requirements:
 - Contents of 5206
 - ◆ Copy available
 - Purpose and description of the medical evaluation

Standard Elements

Recordkeeping:

- ◆ Air monitoring data
- ◆ Objective data
- ◆ Medical surveillance

Standard Elements

Effective Dates:

- ◆ 11/27/06. 20 or more EE
- ◆ 5/30/07. <20 EE
- ◆ All obligations except engineering controls
 - 5/31/10

Resources

- ◆ www.osha.gov
- ◆ OSHA "Small Entity Compliance Guide"
- ◆ OSHA Fact Sheet "Health Effects of Hexavalent Chromium"
- ◆ ToxFAQs for Chromium
www.atsdr.cdc.gov/tfacts7.html
- ◆ DHS/HESIS
www.dhs.ca.gov/ohb/HESIS/cr6.htm
- ◆ NIOSH www.cdc.gov/niosh/topics/hexchrom